Measuring the Effects of Productive Credit through Public Development Banks in Rural Mexico*

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This document, led by specialists from the Inter-American Development Bank, is meant to show the design of a case study to request feedback to improve the study.

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1. Introduction

Credit constraints may be detrimental for the performance of the rural productive sector. But, there is no much evidence on the impact of lifiting these constraints on the production and economic performance of rural producers. Rigorous empirical evidence on the effectiveness of these instruments is very important to properly design public policies, and help Public Development Banks (PDBs) in designing their financial instruments.

There is a vast empirical literature on the impacts of credit programs; however some important knowledge gaps persist. The literature has focused primarily on a few types of interventions, particularly the provision of microcredit[1] (and to some extent, credit guarantees[2]). However, this literature may not be relevant for productive credit programs where treated firms tend to be larger, which imply larger loan amounts, and where the management abilities of business owners tend to be better.

A useful case to consider is that of the different credit programs offered by ***Financiera Nacional de Desarrollo Agropecuario*** (FND) in Mexico. FND loans tend to be larger, approximately $20,000, compared to only $1,000, on average in studies on microcredit. In addition the target population includes established producers with at least seven years of experience. The few available studies, that do focus on loans with higher amounts for small and medium enterprises (SMEs), in general are not targeted to the agricultural sector, and consequently are insufficient to understand the effectives of larger loans in different contexts.[3]

Another knowledge gap in this literature is the lack of studies measuring the effects of credit in the medium- and the long-term, as opposed to only in the short term. Indeed, the fact that the microcredit literature tends to find modest effects of credit on microenterprise performance, may be due to the fact that most evaluations take place one to two years after the intervention (short to medium term). Hence it is not clear if the lack of impacts is due to the fact that expected effects take a long time to materialize, and may be observed only in the medium to long term.

Lastly, the existing literature has focused primarily on the effects on the living conditions of beneficiaries and/or sales and productivity of the enterprises. However, there is no evidence regarding whether loans provided by PDBs help catalyze access to credit from other sources of financing (in particular private banks). Given that PDBs tend to have lower credit history requirements than private banks, public credit may allow firms to establish a credit history with public banks, and to become part of the credit information systems (credit bureaus), so that later on they can access private loans on more favorable terms. Hence, it can be useful to study the effects of credit from public banks not only on firms' investment decisions and productive performance, but also on their financial profile (such as entering private credit markets).

A challege when studying interventions of this type is to properly deal with the possible selection bias associated to who receives the credit. This challenge, in this case, can be solved by relying on a regression discontinuity (RD) approach. This approach is made possible because FND uses a credit-scoring model to select which producers, among all the applicants, are actually approved to receive credit.

The next two sections explain the institutional characteristics associated to the credits provided by FND, and explain how those characteristics can exploited using an RD approach to reliably study the effect of productive credit.

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1. For a review of the current literature on microcredit see Banerjee et al. (2015) and Banerjee (2013).
2. See, for instance, Arráiz et al. (2014); Chandler (2012); Kang et al. (2008); and Zecchini and Ventura (2009).
3. There are only few studies that measure the on investment and production for SMEs. See: Eslava et al. (2014); Banerjee and Duflo (2014); OVE (2014); Paravisini (2004, 2008); Bueso-Merriam et al.(2016); and Echavarría et al. (2017).

2. Institutional Characteristics and Criteria for Credit Approval

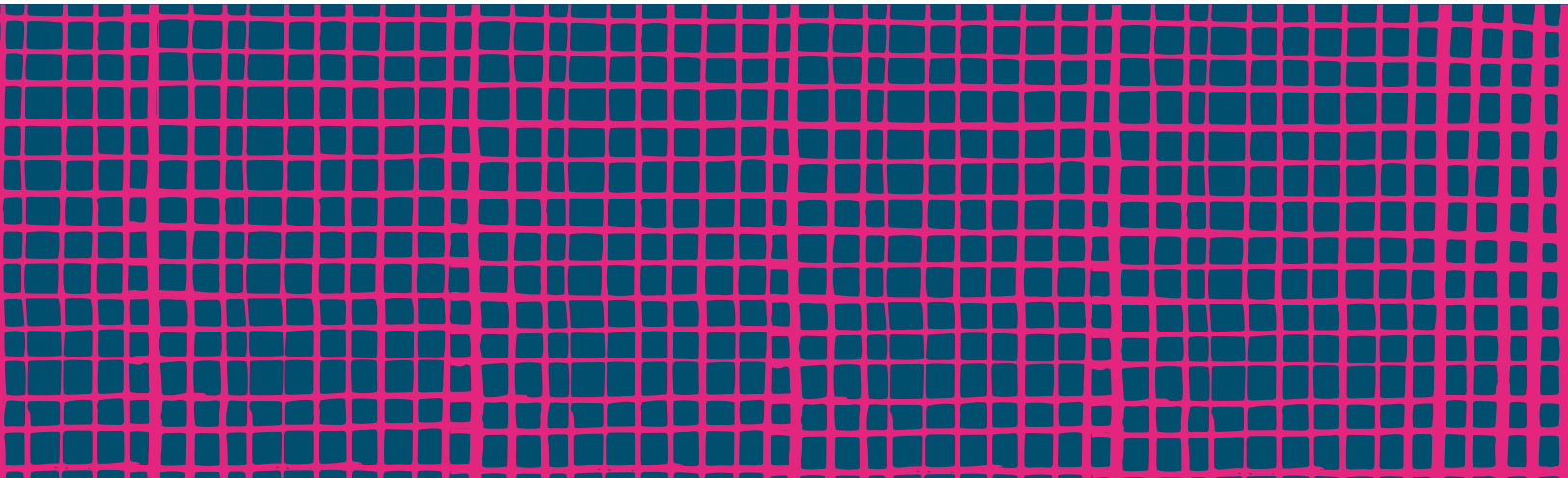
In Mexico FND operates both as a first-tier bank, granting credit directly to final beneficiaries, and as a second-tier bank, channeling credit though other regulated financial institutions. FND offers various types of credit, based on the intended credit use: (i) credits for working capital, and (ii) credits for investment in fixed assets. Working capital loans are generally characterized for being short term loans; they are generally intended for recurring activities such as payroll, input purchase, etc. Investment loans are generally characterized for being medium to long term loans; they are generally intended for asset purchases, such as vehicles, machinery, cattle, etc. FND records the credit type on each loan application; and it ensures that funds are used for their intended purpose via random visits to a small sample of beneficiaries.

All loan requests under a pre-specified amount are evaluated based on a credit scoring methodology (relying on the calculation of default probabilities). FND uses different models to estimate default probabilities,

with the variables included in each model, as well as the decision thresholds varying according to the type of loan requested, the geographic region of the agency where the loan application was filled, the year the loan was requested, and whether the applicant has previous loans with FND, amongst other.

Credit granting decisions, for each application are evaluated using credit scoring. They are determined by comparing the estimated probability of default (R_{ia}) to some decision thresholds. For example, between 2012 and 2014 FND relied on a total of 58 different credit scoring models. For a given scoring model, there are multiple thresholds, which determine the following results: (a) credit approval, (b) requirement to purchase a technological package, (c) application goes to specialized committee (known in Spanish as sub-comité), and (d) credit rejection. The result to "require a technological package" implies that the credit is automatically granted without any additional requirements, conditional on the loan amount being used to purchase a technological package from FND (this applies only to working capital loans). The result "goes to specialized committee" implies that the applicant may appeal to a regional committee. This committee requests additional information, and decides whether to approve the loan based on an evaluation of each individual application.

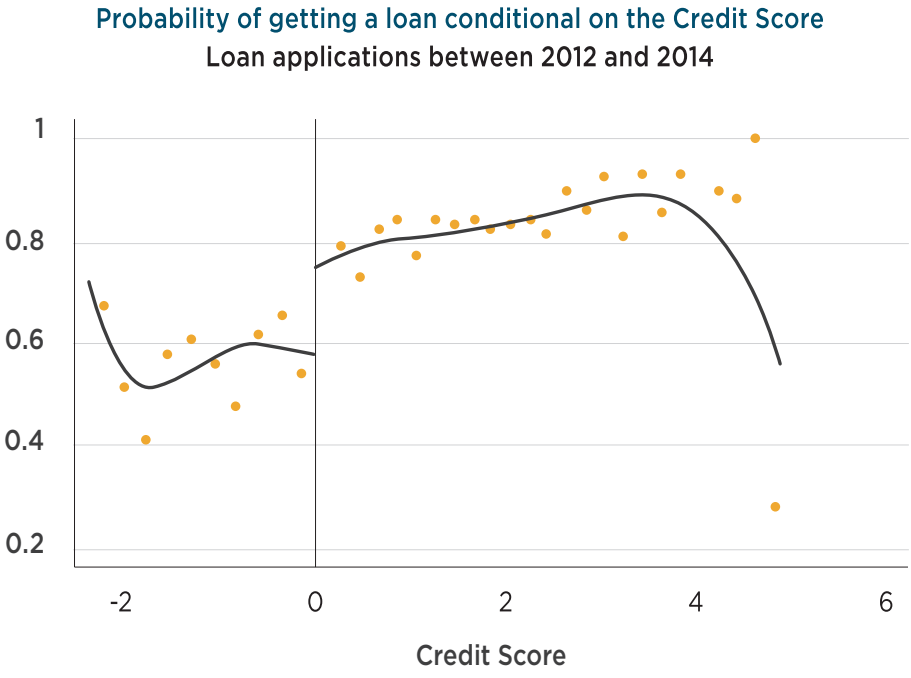
The credit approval criteria discussed above implies that the probability of receiving a loan does not change discretely at the decision thresholds. Individuals slightly under the first threshold are more likely to receive a loan because their application is approved. However, these individual may choose not to pursue the process. Similarly, individuals slightly above the first threshold are less likely to receive a loan because their application is initially rejected. However, these individuals may still get a loan if they purchase a technological package, for working capital loans, or successfully appeal to the regional committee, for investment loans.



3. Methodology

In cases such as this one, a regression discontinuity (RD) design can be a useful approach for studying the effects of receiving a loan (or being intended to receive a loan). RD is an attractive identification strategy in this case, given that it takes advantage of the decision criteria for approving credit applications used by FND. As explained in the previous section, FND determines whether to approve a loan or not, primarily based on a credit scoring model and some cutoff values. RD allows comparing, near the cutoff, those producers/firms that were intended to receive credit based on their credit score, with similar producers that were not intended to receive credit. This, in principle, reduces the risk of selection bias, given that it is assumed that those producers/firms close to either side of the cutoff are very comparable in terms of both observable and unobservable characteristics.

The figure below shows the probability of receiving a loan, conditional on the credit score. On the y-axis the probability of receiving a loan is displayed; and the credit score is displayed on the x-axis. The vertical line shows the cutoff at which FND, using the credit score model, determines who is approved for the loan (for simplicity, only the first cutoff is shown). As it can be seen there is a discontinuity at the cutoff, which implyes that those with a higher value of the normalized credit score are more likely to receive a loan. If receiving a loan has impacts on the performance of rural producers in Mexico, one should see a similar discontinuity at the cutoff for any outcomes under sudy.



Data

Multiple sources of data are needed to apply the methodology described above. In particular, carrying forward such analysis requires both: (i) administrative data from FND and (ii) primary data based on a survey of agricultural producers / enterprises that applied for credit. To apply this methodology, we collected a survey in the north, north-west, and west-central regions of Mexico for producers who applied for credit between 2012 and 2014. This survey collected information on: (i) financial information, (ii) land use, (iii) agriculture, (iv) animals, (v) forestry, and (vi) business perfomance, and (vii) household characteristics. This survey allows applying the RD methodology to better understand the effects of large loans on rural producers.

4. Conclusion

This document outlines how the regresion discontinuity (RD) methodology can be used to estimate the effects of credit by PDBs for rural producers. It may be possible to measure the effect of credit on rural producers in terms of sales, value of output per hectare, technology adoption, and financial inclusion, among others. The results of such study for the case of FND in rural Mexico may help addressing important policy questions.

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